

Surface pressure observation - A view from Reanalysis -

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Reanalysis

- Long series of historical analysis using fixed assimilation system (and data quality control system), to avoid climate change due to analysis system change.
- Fictitious climate signal due to change in observation system is unavoidable
 - may require fixed observation reanalysis

Reanalysis in progress

- ECMWF ERA-45
- US National Reanalysis Program is now under consideration (2005?)
 - NOAA, NASA, NSF, DOE, DOD, ...

Surface pressure observation in reanalysis

- Modern objective analysis utilizes a variety of observations simultaneously to analyze desired fields.
 - Surface pressure can be analyzed from:
 - Surface pressure
 - Surface (10m) winds
 - Satellite (IR and SSM/I) obs
 - Upper air obs.
 - Satellite cloud motion vectors
 - SST
 - Analysis is consistent to these observations within their observation error

Objective analysis and surface pressure

- Dynamical constraints in objective analysis makes surface pressure as “weak” variable, meaning easily driven by other fields (such as winds), and prone to modification by initialization process.
 - But this is strongly dependent on the analysis system (more true for 3-D var but probably not so for 4-D var)
 - It may not be easy to obtain surface pressure observation using simple dynamical balance

Dynamical property of surface pressure

- Strongly affected by gravity wave
- Large diurnal and semi-diurnal oscillation, particularly in tropics
- “Weak” variable

Research required

- Research on reconstruction of 3-dimensional atmospheric fields from surface pressure.
 - May be possible with the use of 4-D var
 - Surface pressure tendency observation may become important.
- Research on diurnal and semi-diurnal variation of surface pressure needs to be performed to properly analyze global pressure field.
- It is necessary to maintain instantaneous observation for use in data assimilation.

Recommendation

- Make the data freely available to Reanalysis communities.
- Archive of surface pressure tendency should be considered.
- Consider separate archive of instantaneous and monthly average observation.
- Observational from new instruments should be properly archived.
- Any consultation with Roy Jenne (NCAR)?